

The 35 U.S.C. §103 Rejection

The Examiner rejected claims 37-39, 46-55, and 62-63 under 35 U.S.C. §103(a) as unpatentable over Williams et al. (U.S. Patent No. 4,857,972) and Hayashi et al. (U.S. Patent No. 5,482,895).

Specifically, the Examiner alleges that Williams describes an etching composition comprising HCl, hydrogen peroxide, and deionized water. The Examiner recognizes that Williams et al. does not describe the claimed ratios, but alleges that Hayashi et al. teaches using a copper etchant having a ratio of mineral acid:peroxide of either 1:1 or 3:1. As such, the Examiner alleges that it would have been obvious for one of skill in the art at the time of the invention to determine the optimum ratio of the etchant's components depending upon the type of material being etched and through experimentation with an anticipation of an expected result. Applicants respectfully traverse this rejection.

The Examiner further acknowledges that the cited references do not describe that the composition has an etching rate for cobalt and metal nitride as described in claims 47, 51, 52, and 62. However, the Examiner alleges that such etching rates would be obvious to one skilled in the art through experimentation and test runs since the compositions of the references cited can be used to etch metal and metal alloys which would include cobalt and metal nitride.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally the prior art references must teach or suggest all the claim limitations. See M.P.E.P. § 2143.

Each of the pending independent claims describes at least one limitation that is not taught or suggested by the cited references. Claim 38 describes an etching composition that has a ratio in a range of about 1:1:35 (mineral acid:peroxide:deionized water) to about 1:1:5 (mineral acid:peroxide:deionized water); claim 47 describes an etching composition that has a ratio in a range of about 1:1:35 (mineral acid:peroxide:deionized water) to about 1:1:5 (mineral acid:peroxide:deionized water) and which has an etch rate greater than about 1000 Å/minute for

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cobalt; claim 52 describes an etching composition that has a ratio in a range of about 1:1:35 (mineral acid:peroxide:deionized water) to about 1:1:5 (mineral acid:peroxide:deionized water) and which has an etch rate of about 50 Å/minute to about 250 Å/minute for metal nitride; and claim 62 describes an etching composition that has an etch rate of about 50 Å/minute to about 250 Å/minute for metal nitride and an etch rate greater than about 1000 Å/minute for cobalt.

The Examiner has acknowledged that such limitations are not described in the references cited, but alleges one skilled in the art would find such limitations obvious. However, the present invention is beneficial for etching cobalt and metal nitride with a single solution as described in at least one embodiment of the present invention. This single solution is the composition described in the pending claims. It would not have been obvious to provide a single solution with such etching capabilities in view of the cited references as neither Williams et al. nor Hayashi et al. recognize the problems or advantages of removing cobalt and a metal nitride with a single solution. In fact, Hayashi et al. directly teaches away from such a composition by its use of one solution for cobalt and another for metal nitride. As such, one skilled in the art would not experiment to attain the limitations related to ratios and etch rates described according to the present invention as alleged by the Examiner.

Further, there is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine Williams et al. and Hayashi et al. to attain the present invention.

As mentioned above, Williams et al. does not describe the claimed ratio nor the etch rates described in the pending claims. For example, Williams et al. teaches a rather dilute composition of 600 ml of deionized water, 150 ml of 15 weight percent aqueous sulfuric acid, and 50 ml of 50 weight percent active aqueous hydrogen peroxide to etch metals and alloys. *See* Williams et al., Column 5, lines 16-21. Further, Hayashi et al., on the other hand, teaches an etching composition of HCl and hydrogen peroxide in a ratio of 1:1, and a composition of sulfuric acid and hydrogen peroxide in a ratio of 3:1. As such, Hayashi et al. teaches more concentrated compositions of HCl and hydrogen peroxide and sulfuric acid and hydrogen peroxide. *See* Hayashi et al., Column 10, lines 53-55. Therefore, there would have been no motivation or

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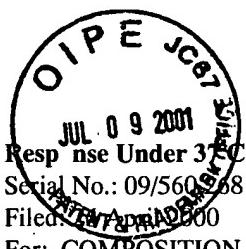
suggestion to modify the teachings of Williams (e.g., dilute compositions) with those of Hayashi et al. (e.g., higher concentration solutions), as the Williams et al. composition would be made with a higher hydrogen peroxide and acid content, which is directly opposite of the more dilute compositions according to the present invention.

The Examiner disagrees with the Applicants' argument that Hayashi teaches a more concentrated composition indicating that the ratio displayed in Hayashi et al. is more representative of the ratio between the components as opposed to the actual concentration of the components in the composition. However, there is no support in Hayashi et al. for such an assertion and each representation of compositions therein shows a ratio similar to that in column 10 indicating that the ratios actually show concentration (i.e., see column 7, column 14, etc.) which is a typical interpretation. As such, Hayashi et al. does teach away from combination with Williams et al.

Further, as previously mentioned, Williams et al. nor Hayashi et al. recognize the problems or advantages of removing cobalt and a metal nitride with a single solution. In fact, Hayashi et al. directly teaches away from such a composition by its use of one solution for cobalt and another for metal nitride. As such, one would not modify Williams et al. with Hayashi et al to get a single solution with the specified range of etch rates for two particular materials, i.e., metal nitride and cobalt.

In addition, there must be a reasonable expectation of success when combining the references. There is nothing in the references that would suggest that a combination of Williams et al. and Hayashi et al. would be successful in the etching of two different materials, e.g., a metal nitride and cobalt, using the same solution. In fact, as indicated above, Hayashi et al. teaches away from such an etch indicating that two different solutions are required to perform the etch of cobalt and metal nitride, i.e., Hayashi et al. uses one solution for cobalt and another for metal nitride.

For the above reasons, Applicants respectfully submit that the independent claims 38, 47, 52, and 62 are patentable over Williams et al. and Hayashi et al. Further, dependent claims 37, 39, 46, 48-51, 53-55, and 63 depend from respective independent claims and include all the



Response Under 37 C.F.R. §1.116 - Expedited Examining Procedure

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limitations thereof. As such, the dependent claims are also patentable over Williams et al. and Hayashi et al. for the same reasons. Reconsideration and withdrawal of the rejections are, therefore, respectfully requested.

Allowable Subject Matter

Applicant acknowledges the allowance of claims 56-61.

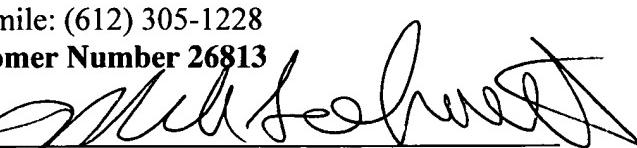
Summary

In view of the above remarks, reconsideration and withdrawal of the rejections are respectfully requested. It is respectfully submitted that the pending claims are in condition for allowance and notification to that effect is respectfully requested. The Examiner is invited to contact Applicants' Representatives, at the below-listed telephone number, if it is believed that prosecution of this application may be assisted thereby.

Respectfully submitted,

Lee et al.

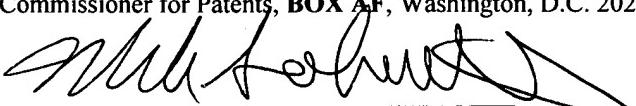
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6 July 2001
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CERTIFICATE UNDER 37 CFR §1.8:

The undersigned hereby certifies that this paper is being deposited with the United States Postal Service as first class mail, in an envelope addressed to: Assistant Commissioner for Patents, BOX AF, Washington, D.C. 20231 on the 6th day of July, 2001.

By: 
Name: Mark J. Gebhardt



**APPENDIX A - SPECIFICATION AMENDMENTS
INCLUDING NOTATIONS TO INDICATE CHANGES MADE**

Serial No.: 09/560,268

Docket No.: 150.0056 0102

Amendments to the following are indicated by underlining what has been added and bracketing what has been deleted.

In the Title

The title has been amended as follows:

[METHOD AND] COMPOSITION FOR SELECTIVELY ETCHING AGAINST
COBALT SILICIDE

*RECEIVED
JUL 10 2001
TC 1700*